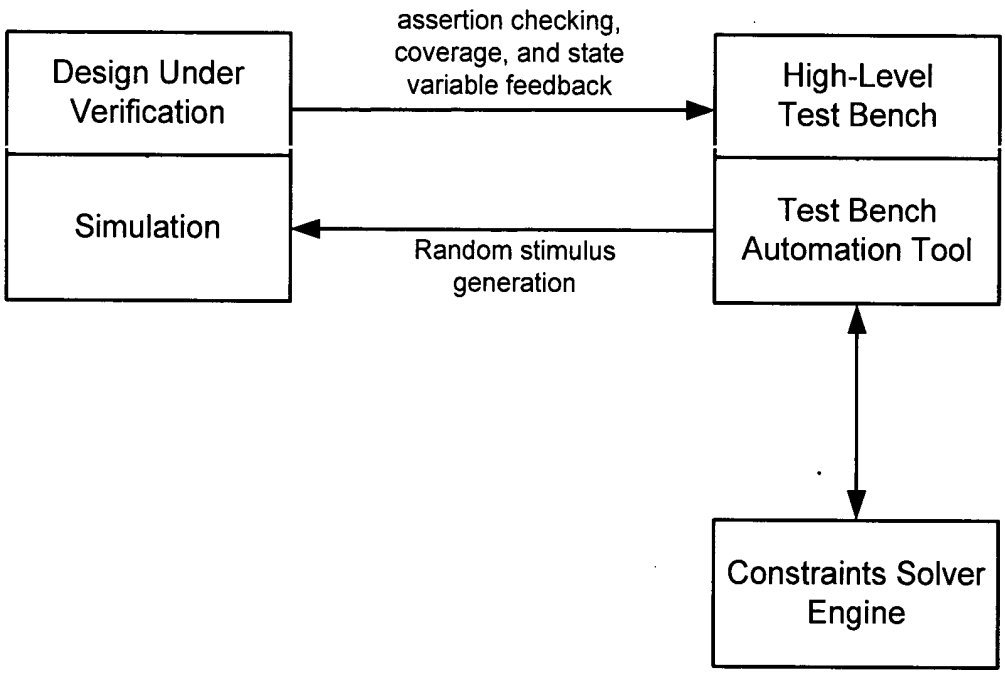

Design Under Verification
Simulation
assertion checking, coverage, and state variable feedback
Random stimulus generation
High-Level Test Bench
Test Bench Automation Tool
Constraints Solver Engine

Figure 1

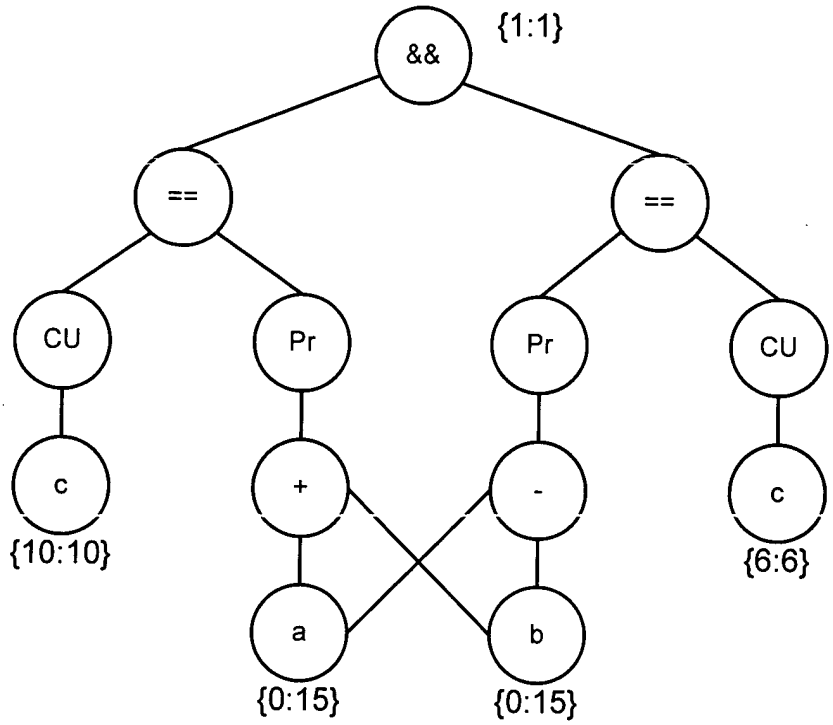


FIGURE 2

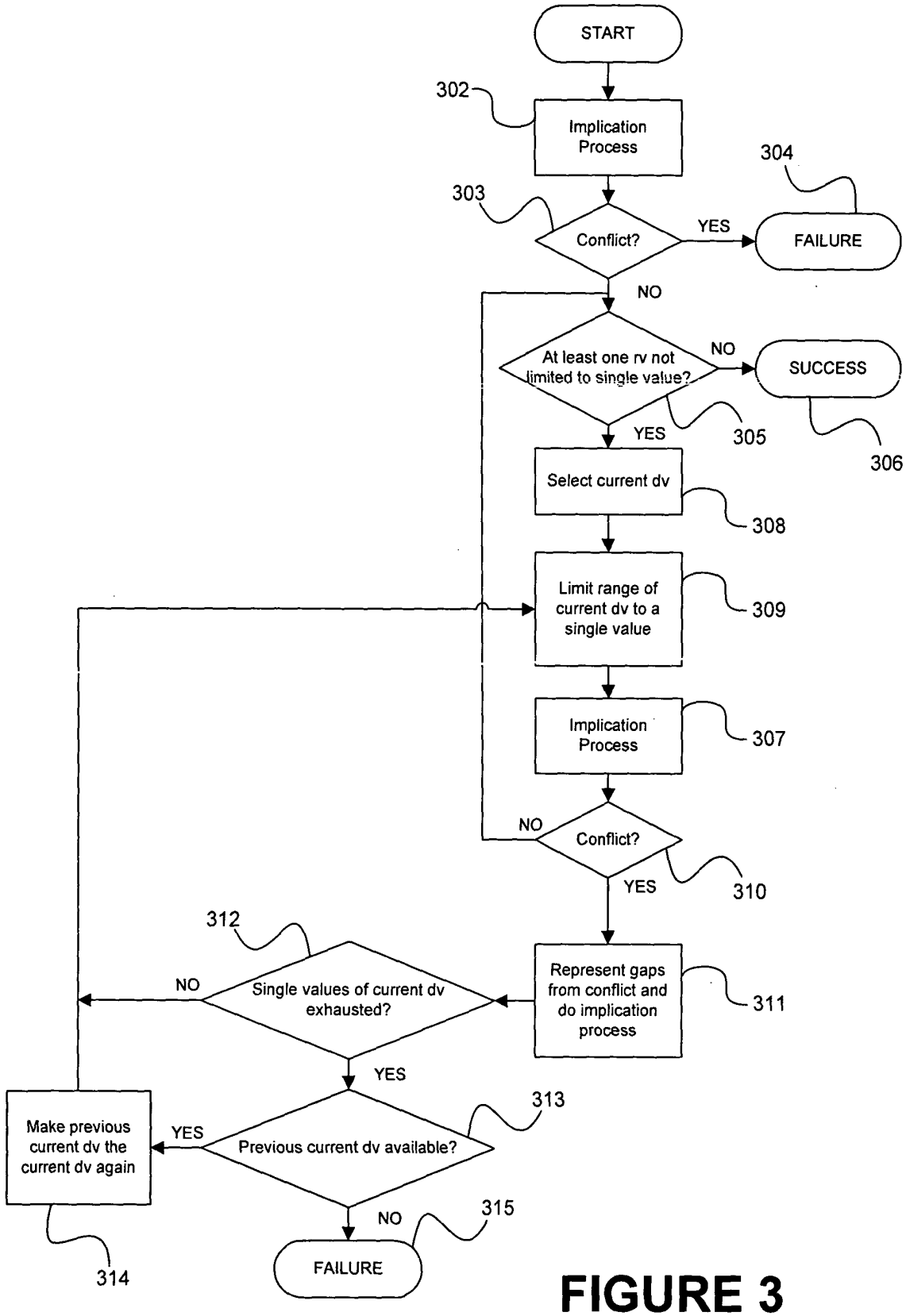
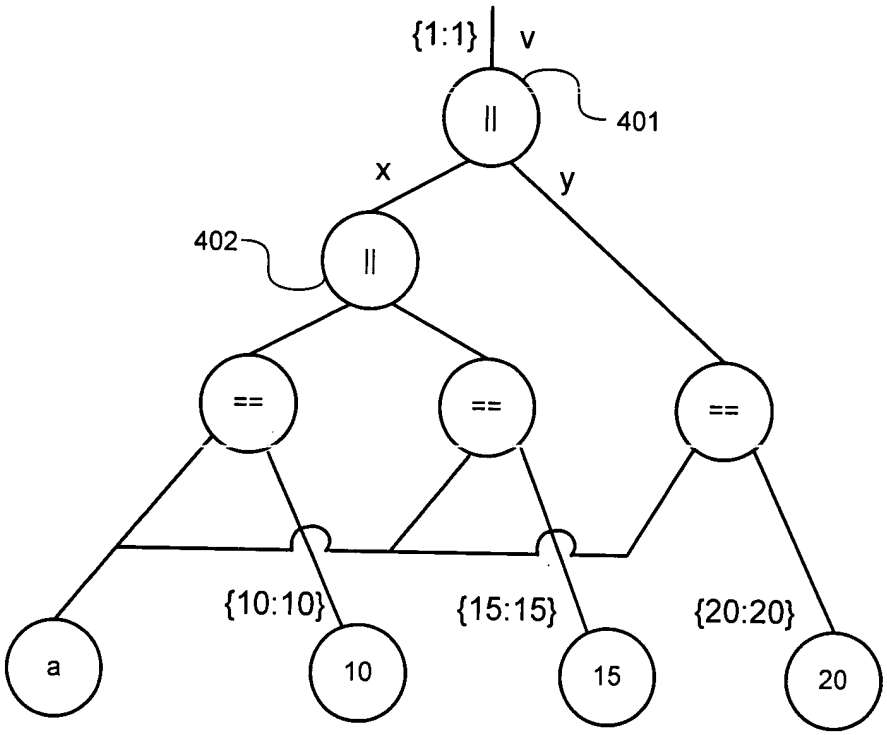

START
302
Implication Process
304
303
Conflict?
YES
FAILURE
NO
At least one rv not limited to single value?
NO
SUCCESS
YES
305
306
Select current dv
308
Limit range of current dv to a single value
309
Implication Process
307
NO
Conflict?
310
YES
312
Represent gaps from conflict and do implication process
311
NO
Single values of current dv exhausted?
YES
313
Make previous current dv the current dv again
YES
Previous current dv available?
NO
315
314
FAILURE

FIGURE 3



Example Constraint Set Representation to Illustrate Case-Based Learning

FIGURE 4

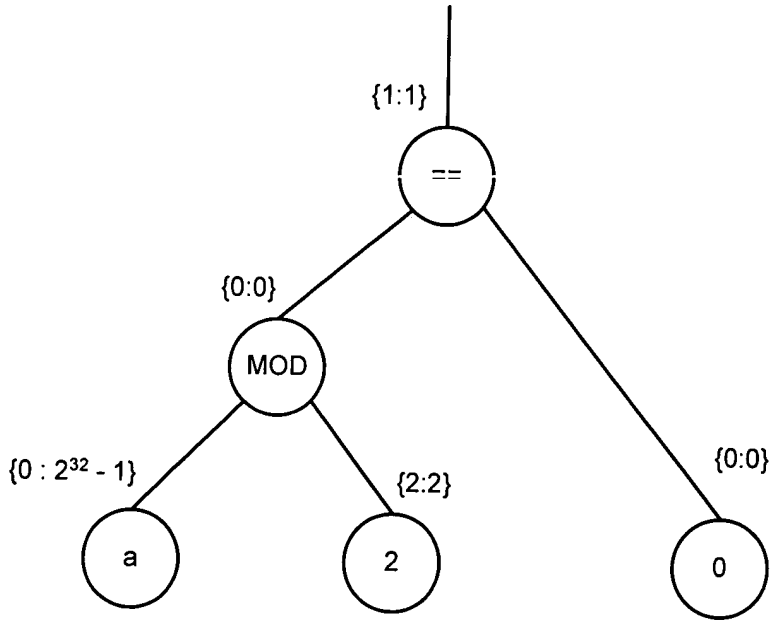
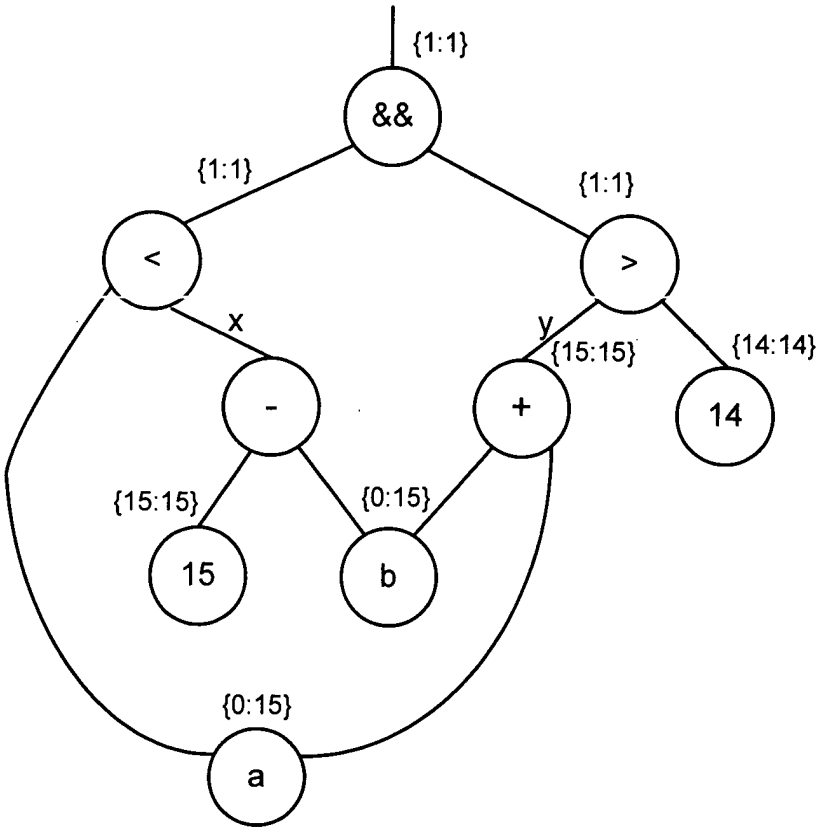


FIGURE 5



Example to Illustrate Static Implication
Cyclic Behavior

FIGURE 6A

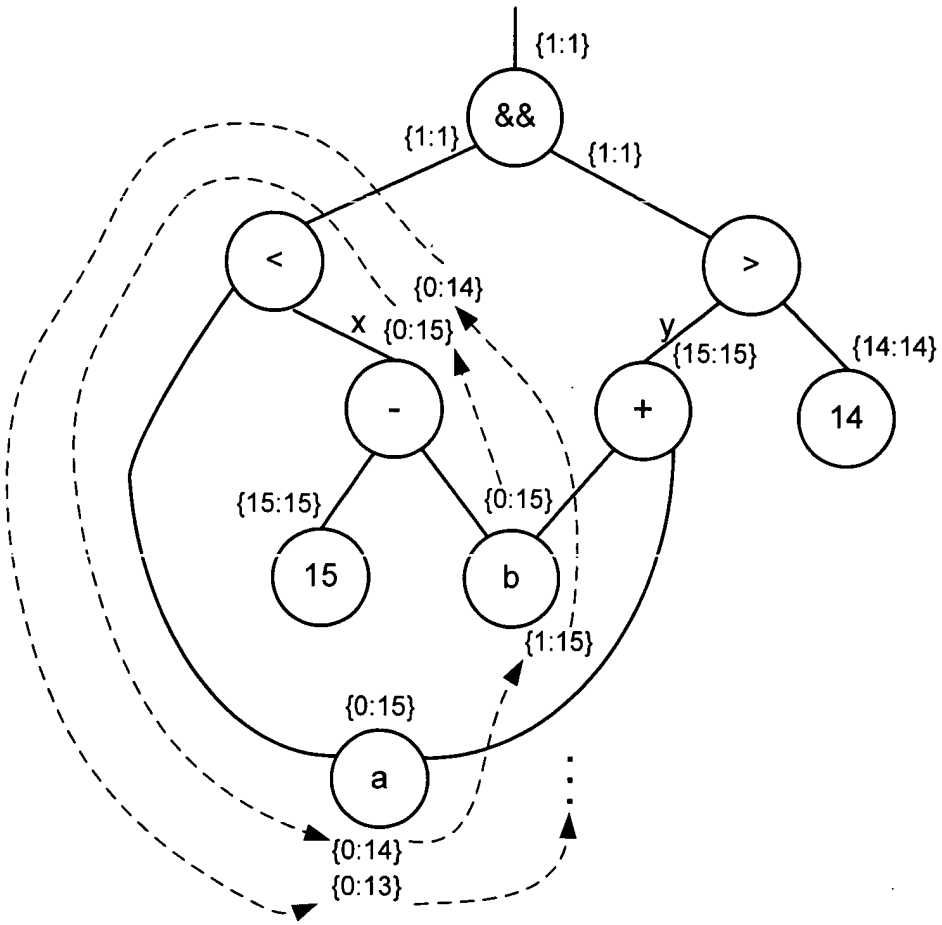


FIGURE 6B

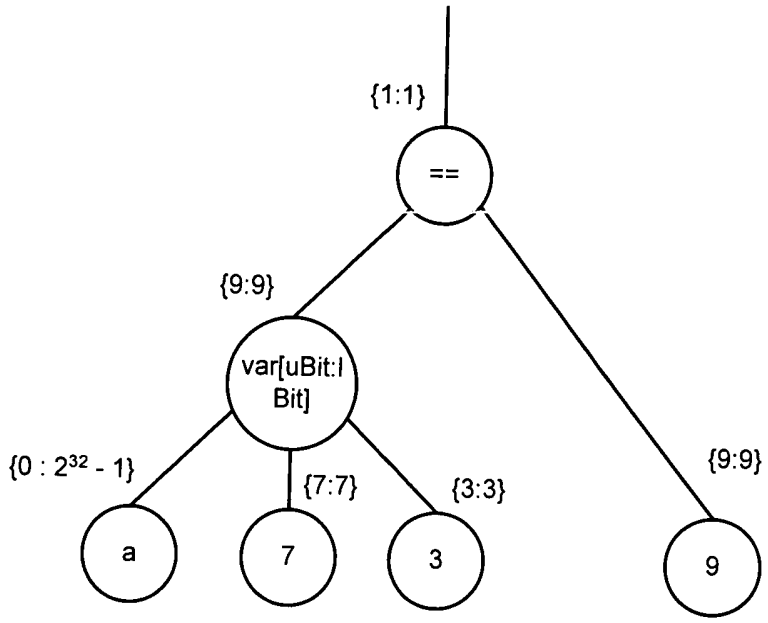


FIGURE 7

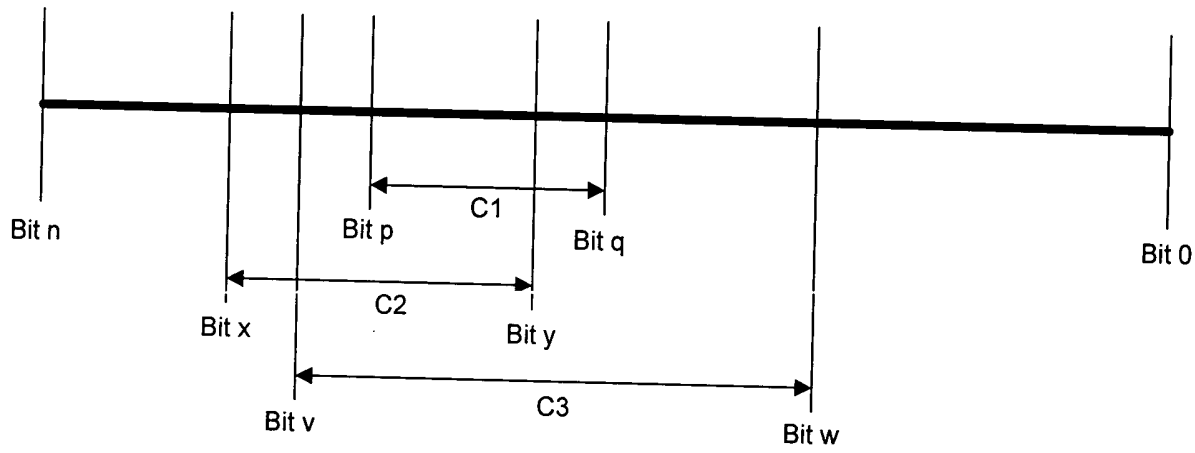


FIGURE 8

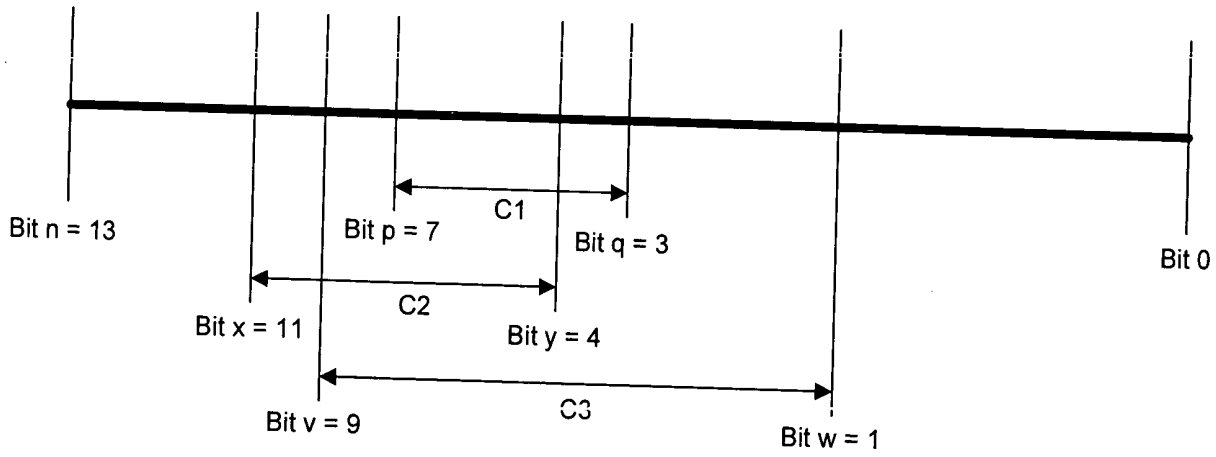


FIGURE 9

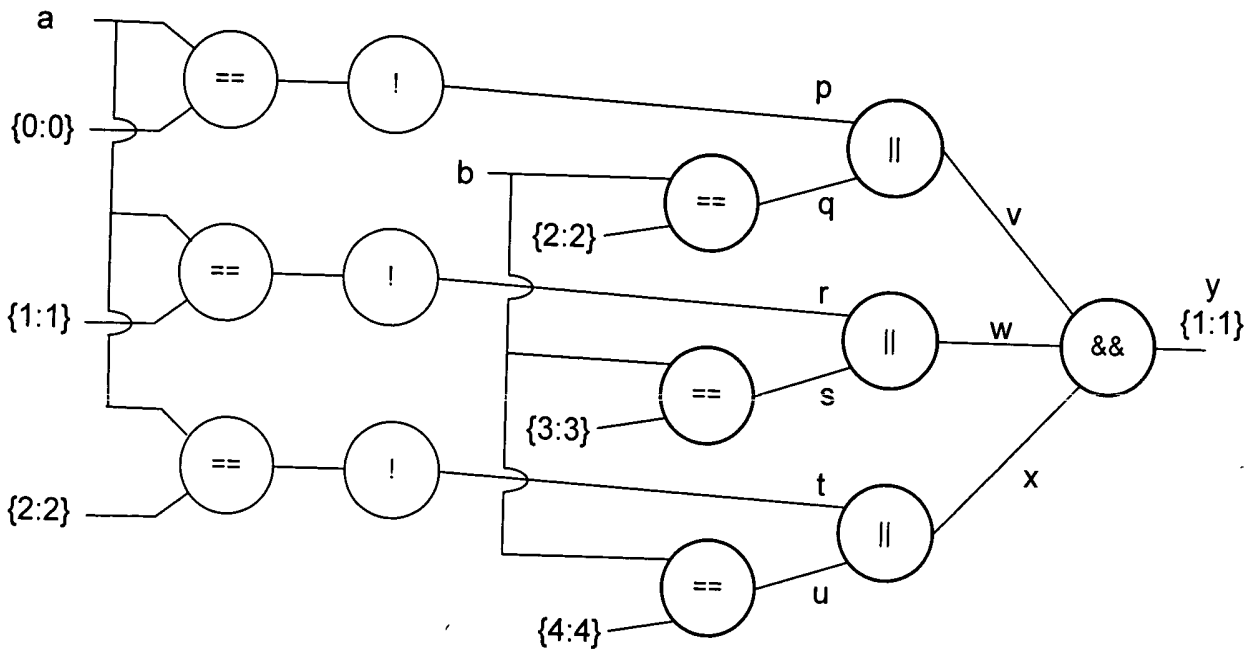


FIGURE 10A

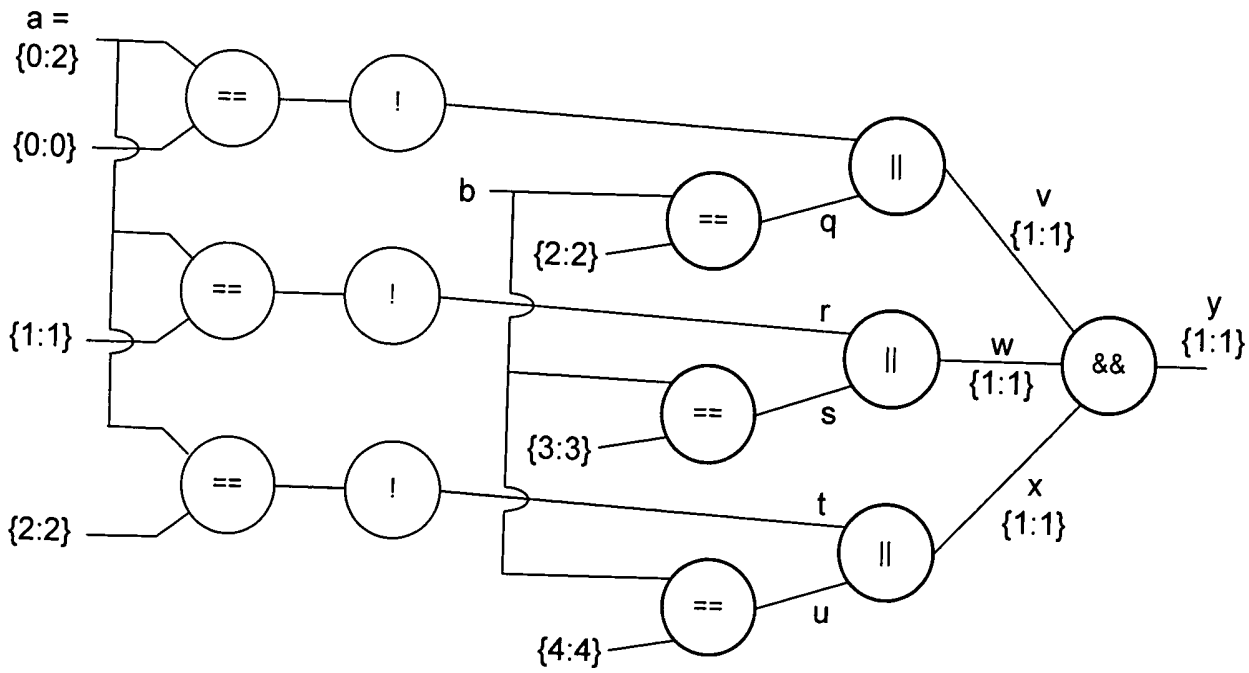


FIGURE 10B

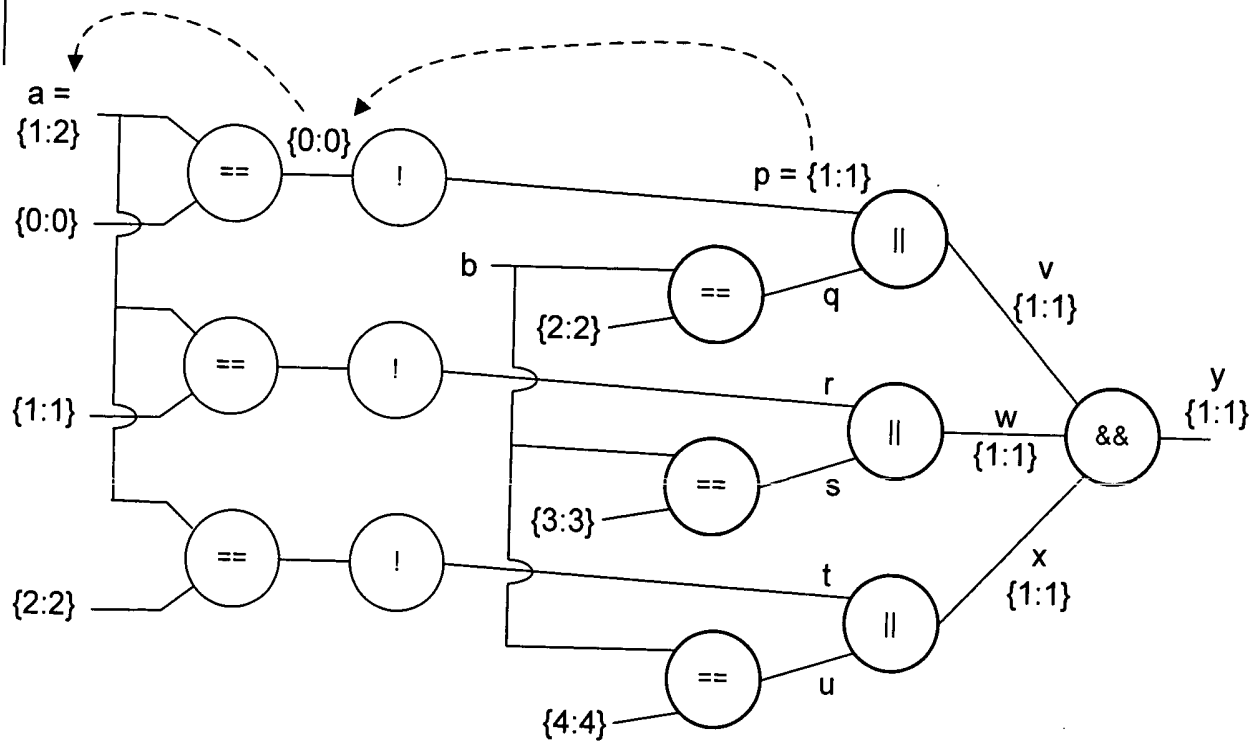


FIGURE 10C

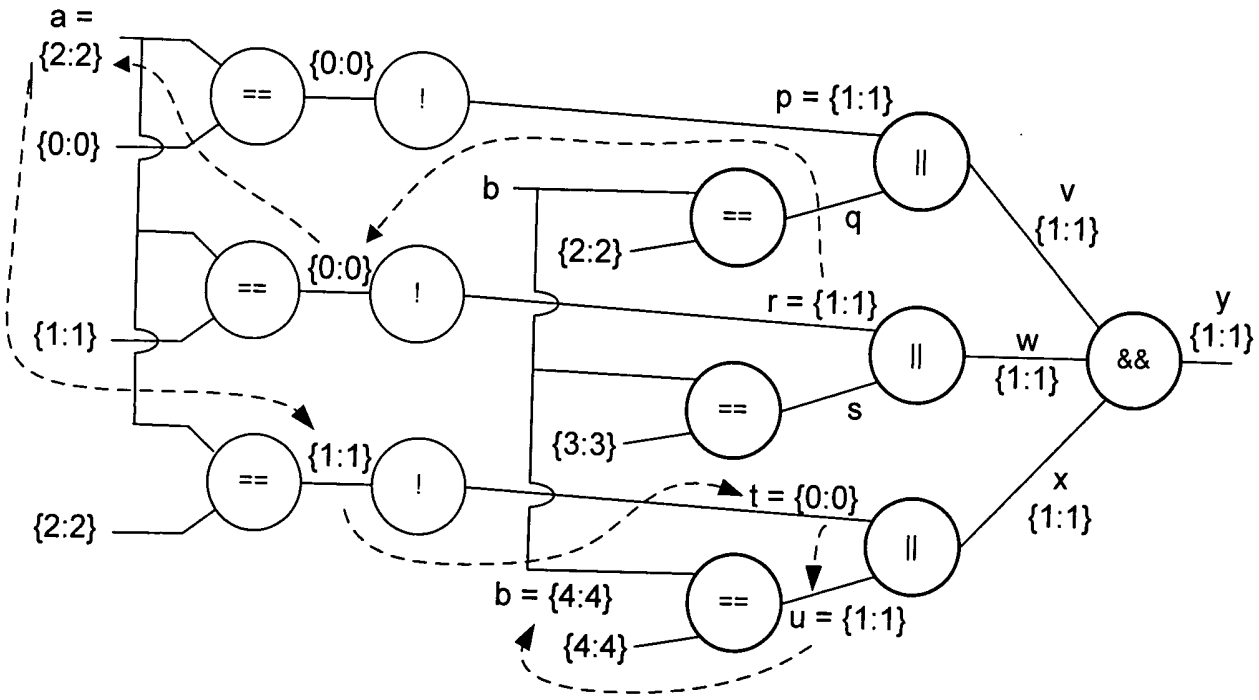


FIGURE 10D

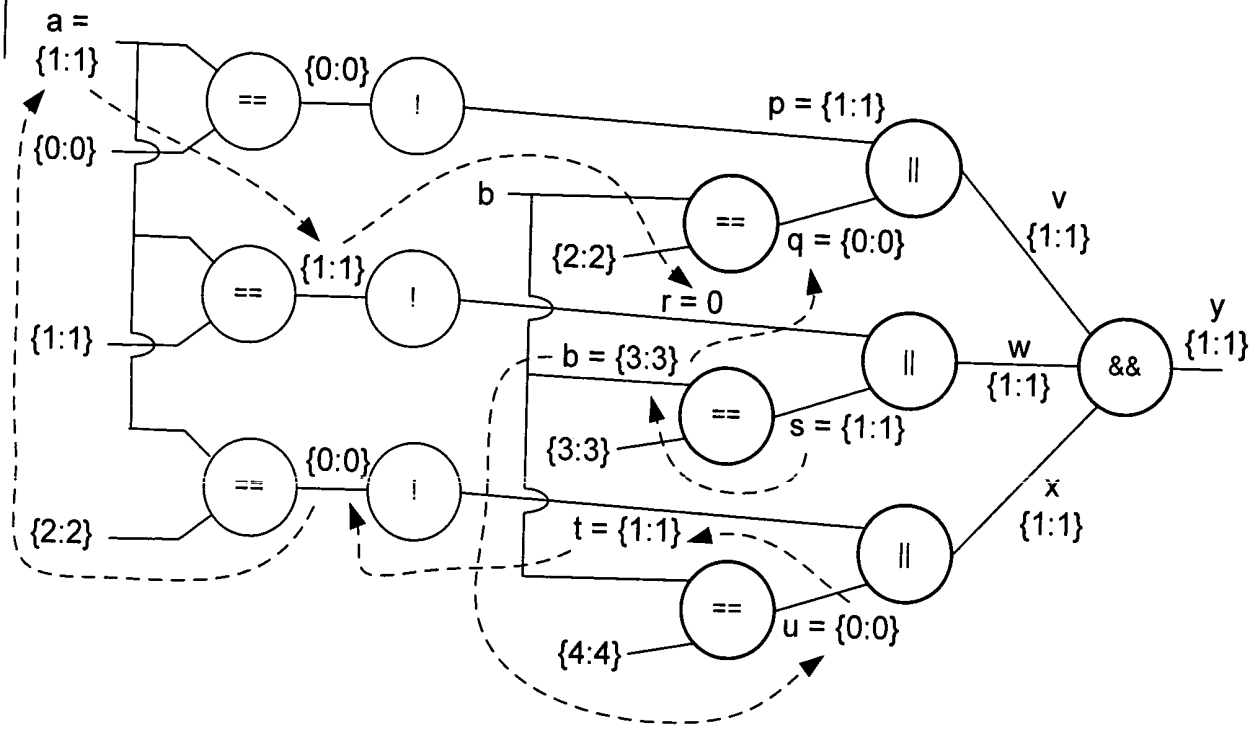


FIGURE 10E

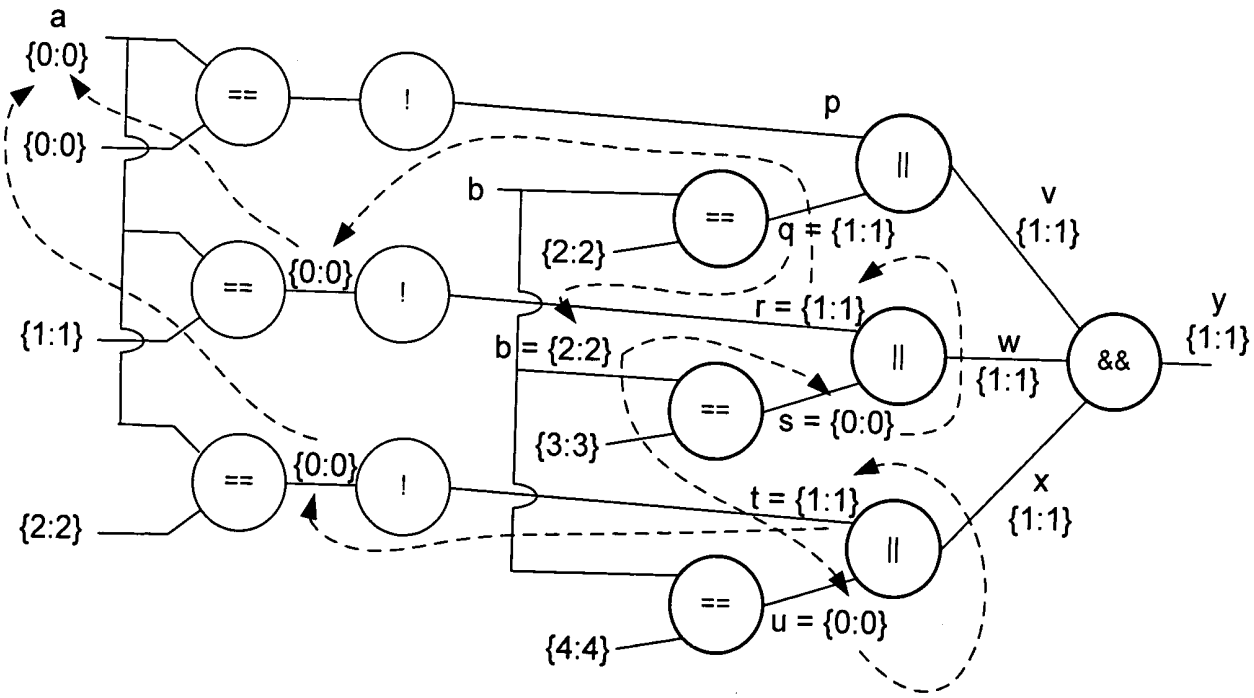


FIGURE 10F

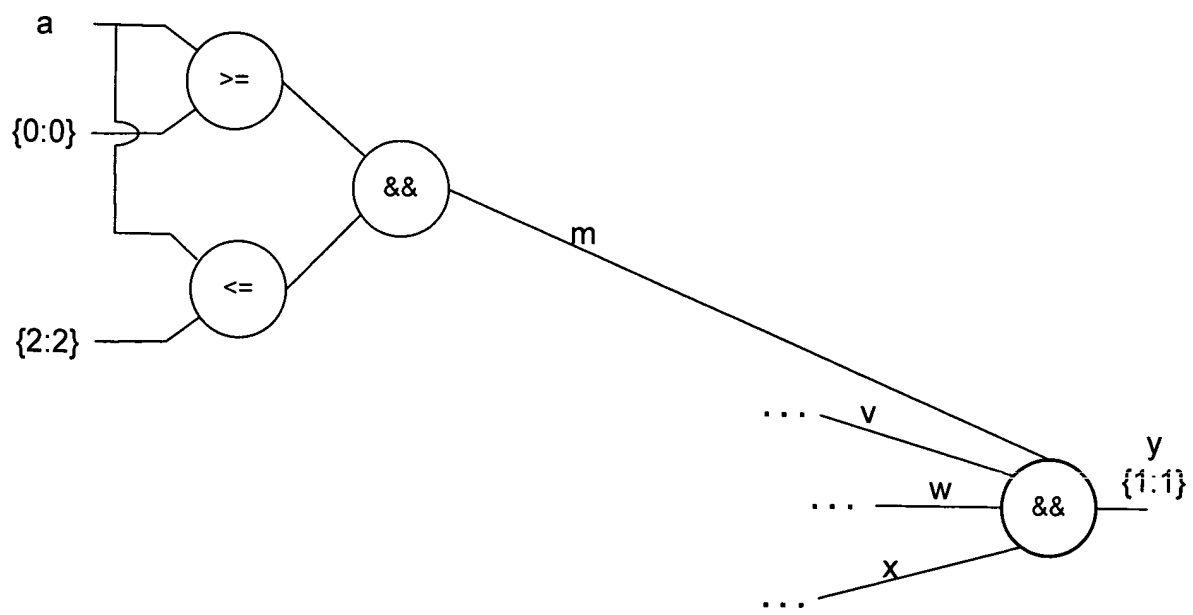


FIGURE 11A

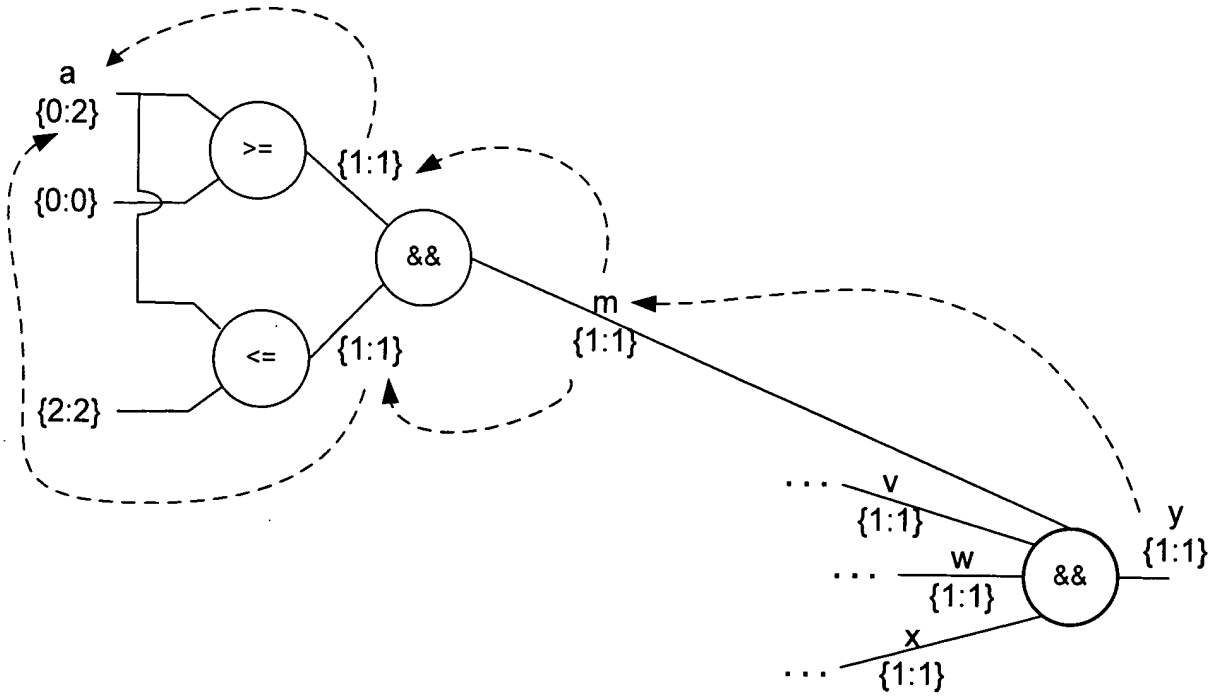


FIGURE 11B

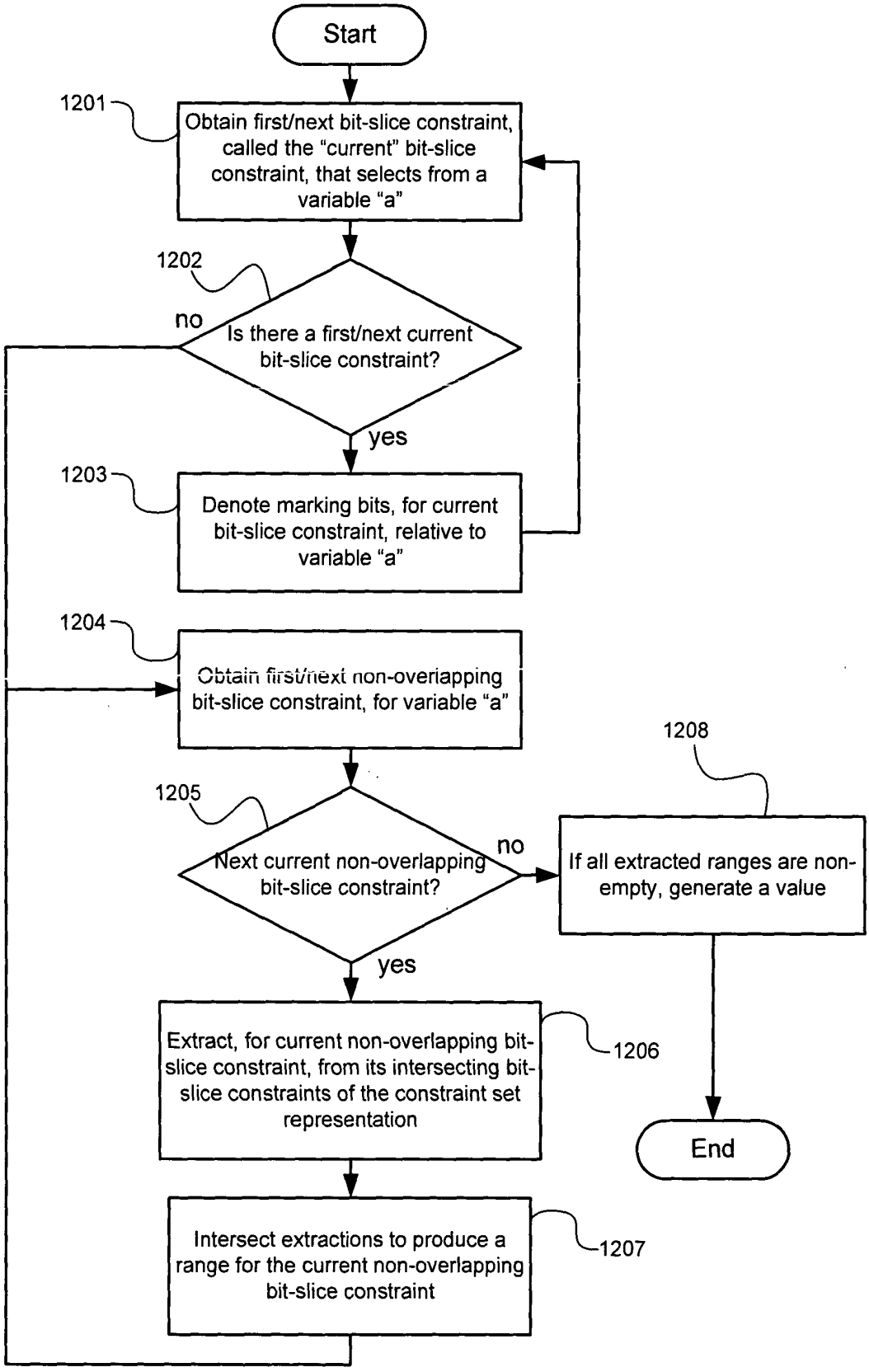

Start
1201
Obtain first/next bit-slice constraint, called the "current" bit-slice constraint, that selects from a variable "a"
1202
Is there a first/next current bit-slice constraint?
no
yes
1203
Denote marking bits, for current bit-slice constraint, relative to variable "a"
1204
Obtain first/next non-overlapping bit-slice constraint, for variable "a"
1205
Next current non-overlapping bit-slice constraint?
no
yes
1208
If all extracted ranges are non-empty, generate a value
End
Extract, for current non-overlapping bit-slice constraint, from its intersecting bit-slice constraints of the constraint set representation
1206
Intersect extractions to produce a range for the current non-overlapping bit-slice constraint
1207

FIGURE 12

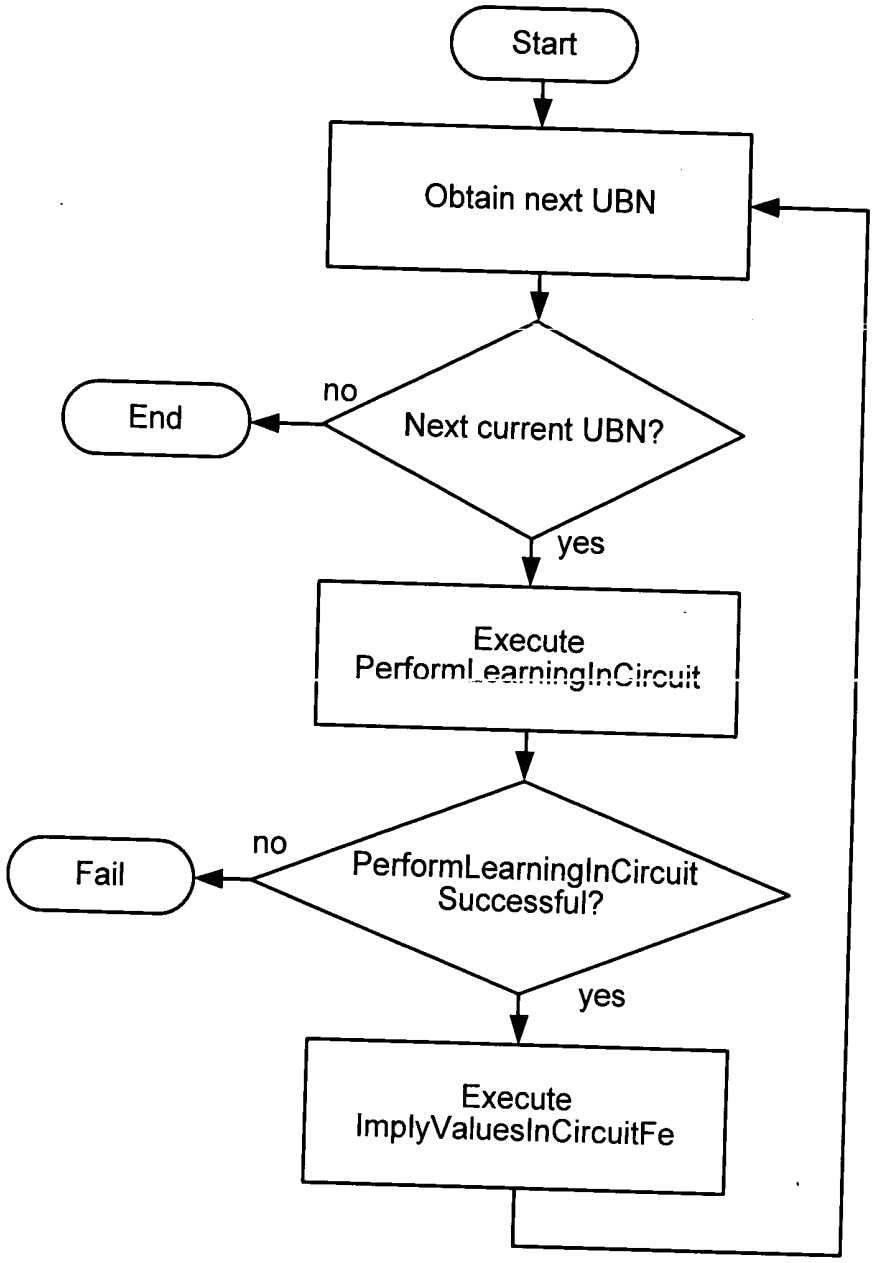

Start
Obtain next UBN
Next current UBN?
no
End
yes
Execute PerformLearningInCircuit
PerformLearningInCircuit Successful?
no
Fail
yes
Execute ImplyValuesInCircuitFe

FIGURE 13A

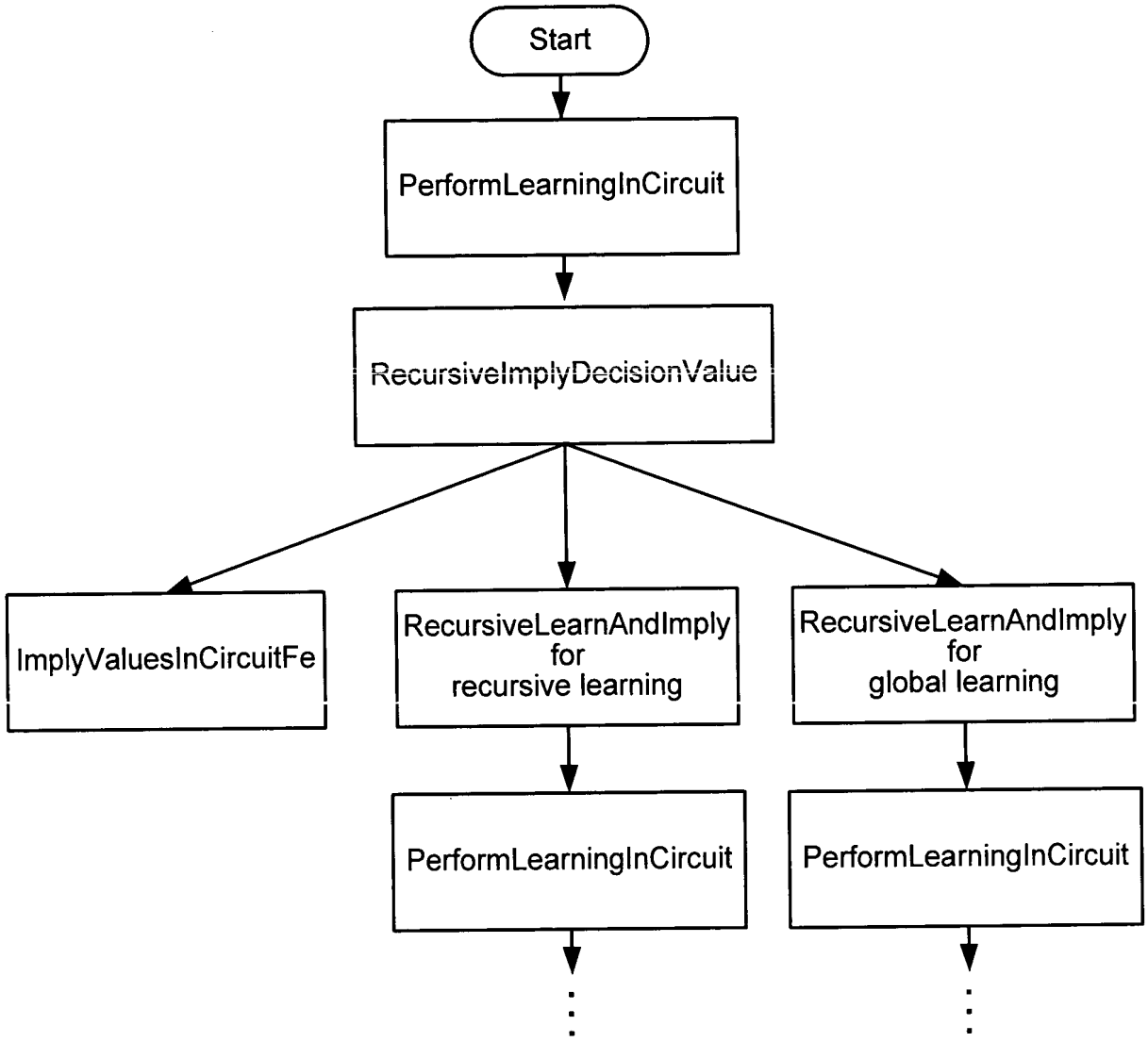

Start
PerformLearningInCircuit
RecursiveImplyDecisionValue
ImplyValuesInCircuitFe
RecursiveLearnAndImply for recursive learning
RecursiveLearnAndImply for global learning
PerformLearningInCircuit
PerformLearningInCircuit

FIGURE 13B

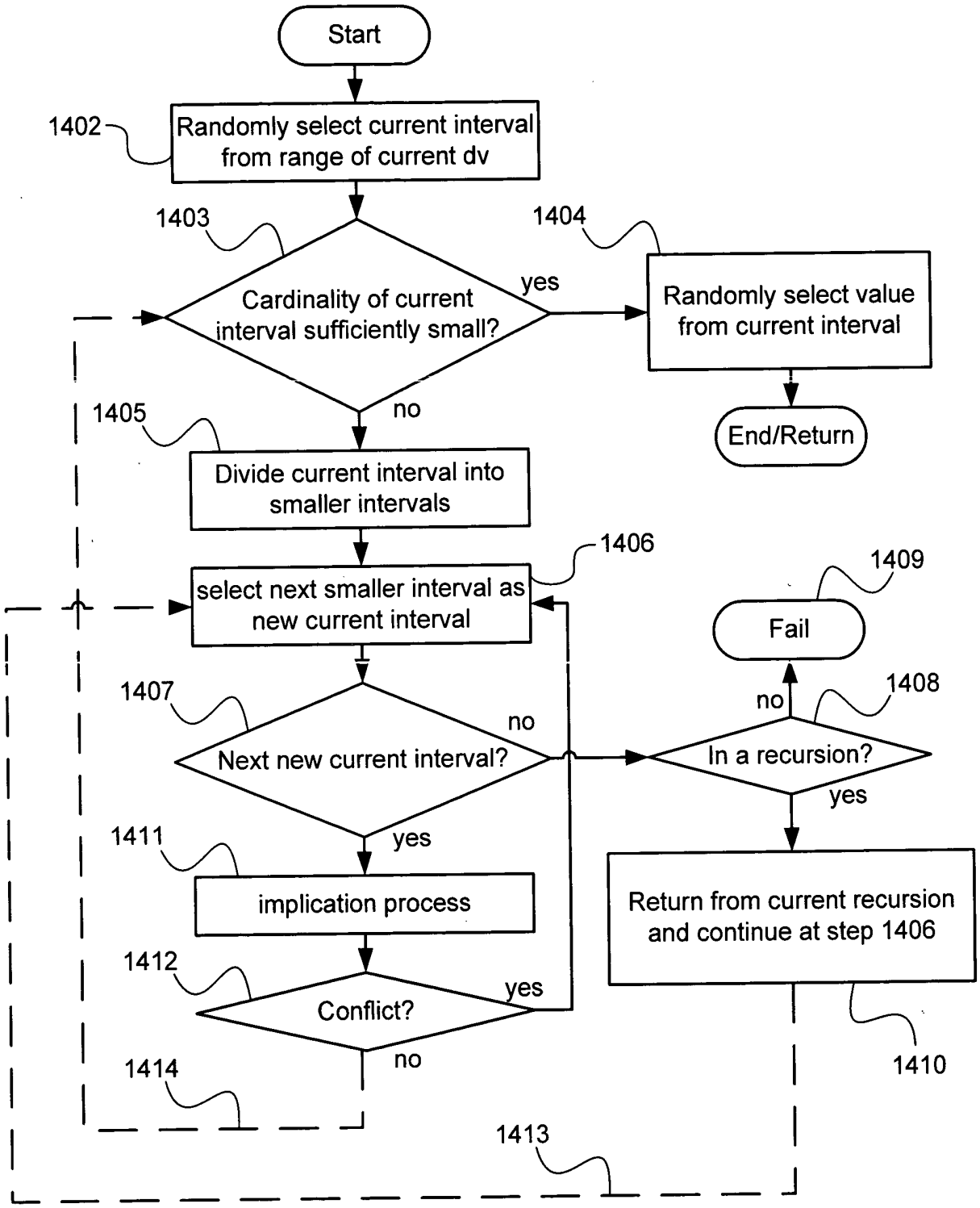

Start
1402
Randomly select current interval from range of current dv
1403
Cardinality of current interval sufficiently small?
yes
1404
Randomly select value from current interval
End/Return
no
1405
Divide current interval into smaller intervals
1406
select next smaller interval as new current interval
1407
Next new current interval?
no
yes
1408
In a recursion?
no
yes
1409
Fail
1411
implication process
1412
Conflict?
yes
no
1414
1413
Return from current recursion and continue at step 1406
1410

FIGURE 14

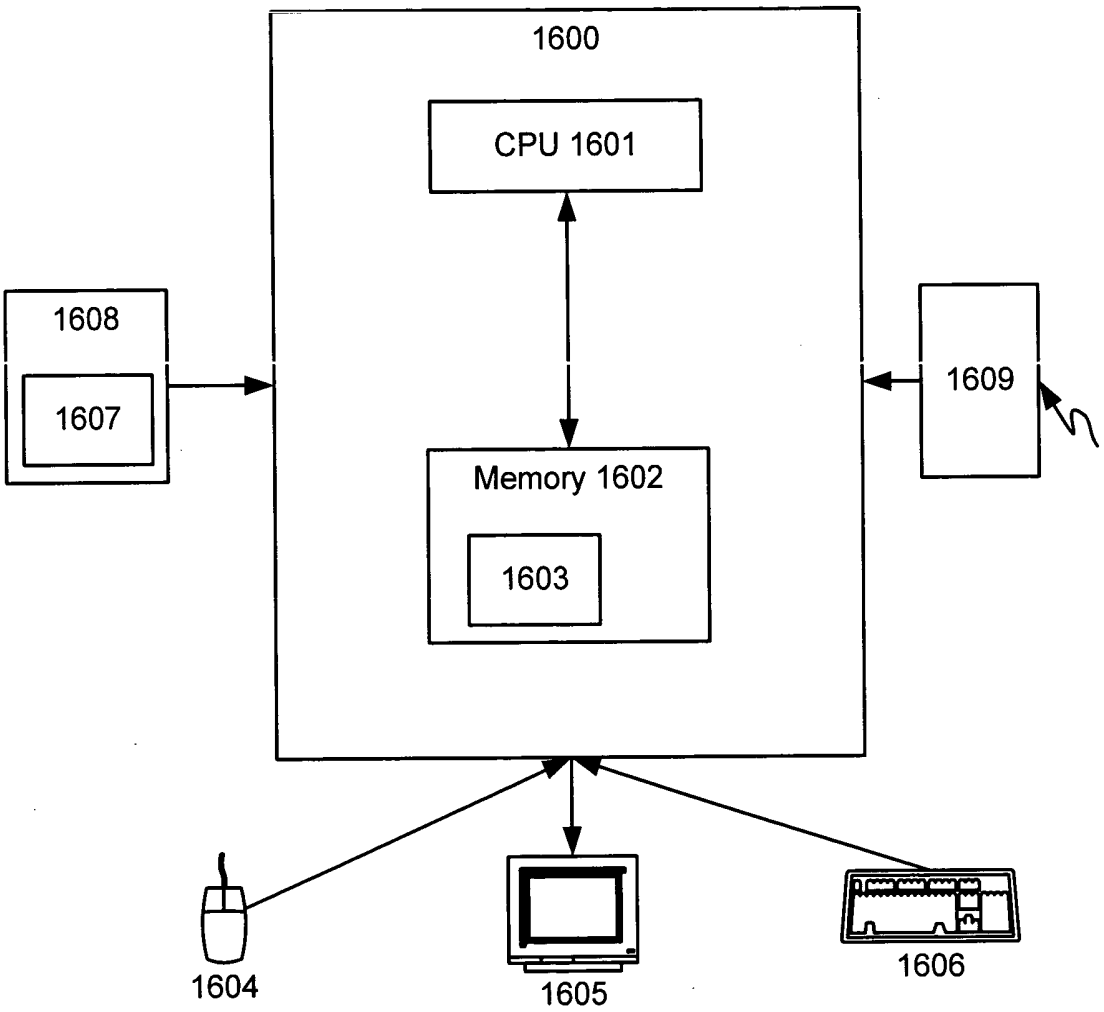


FIGURE 15